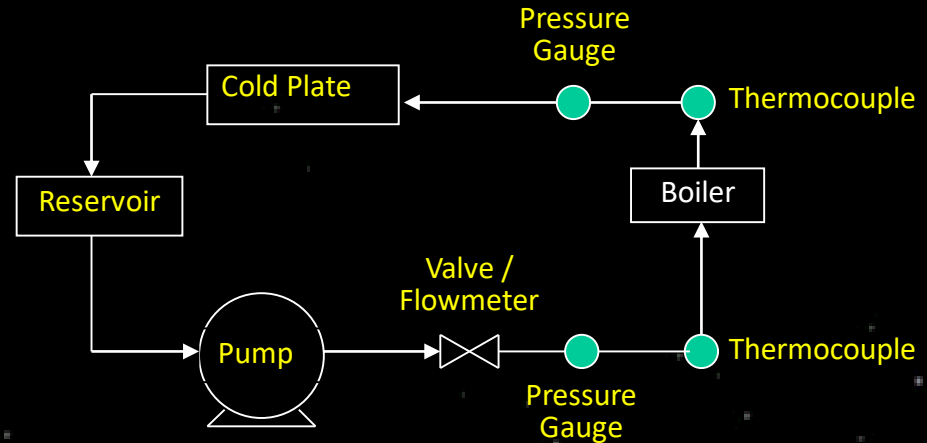


Mechanically Pumped Loop for Spacecraft Thermal Management

Robert Gerace, Clive Gierbolini, Dan Griffith, Jake Overton, John Pardekooper

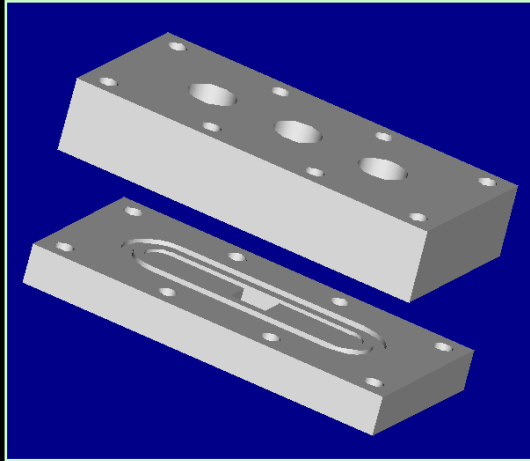


Objectives:

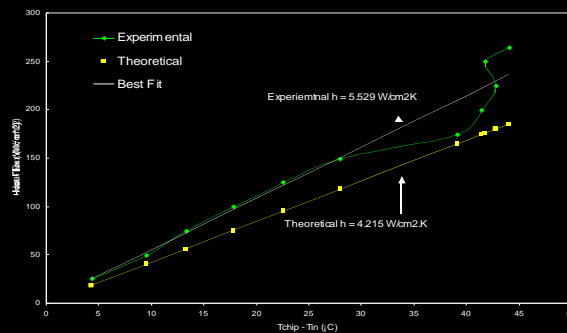
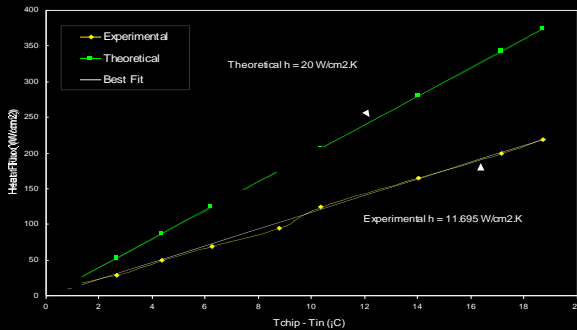
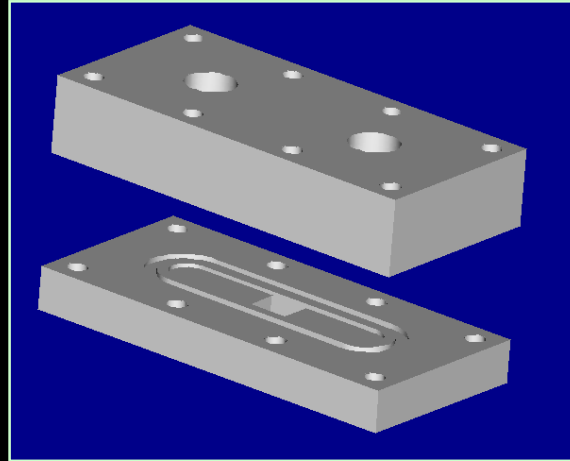
- Develop a pumped cooling loop capable of dissipating high heat fluxes from an electronic source in spacecraft.
- Explore boiler designs utilizing jet impingement and micro-channel cooling
- Minimize size and weight of all loop components.



Jet Impingement Boiler Design



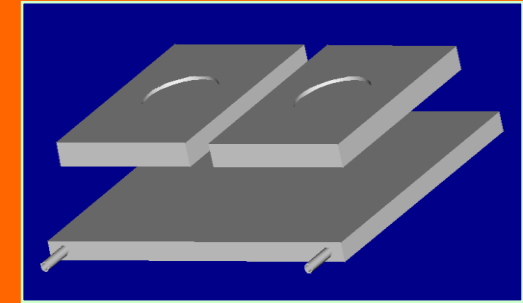
Micro-channel Boiler Design



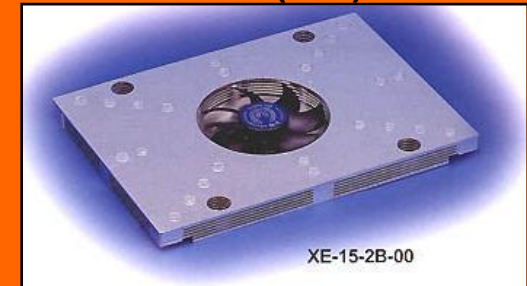
Key Findings:

- Micro-channel flow case: chip temperature maintained at 113°C while dissipating 265 W/cm^2 without incurring critical heat flux.
- Jet impingement case: chip temperature maintained at 80°C while dissipating 220 W/cm^2 without incurring critical heat flux.

Cold Plate & Fans



Fan (2 of)



- Possess lateral fins
- 12 V / 0.22 Amps
- 20 CFM air flow

Gear Pump



- Max pressure of 23 psi
- 1.75" x 2.5" x 4"
- 0.63 lbs
- 12 V / 2.2 Amps